Certificate course	July (Odd Semester)	Water Analysis
PO's Aligned – As listed below		Credit- 02 (T-1, P-1), Total Number of Teaching Hours- 45Hrs

PROGRAMME OUTCOMES (POs)

PO-1: Learning Environment: This program equips students to demonstrate independent learning skills, readily adapts to new knowledge and technologies, and actively pursues continuing professional development.

PO-2:Critical Thinking: This program equips students to apply critical thinking to evaluate research data, propose novel hypotheses, and translate scientific advancements to address global issues related to sustainability.

Programme Specific Outcomes (PSOs)

PSO1:Graduates will design and implement self- directed learning plans that incorporate emerging technologies and updated knowledge in their discipline, and will maintain lifelong professional development through certifications, workshops, and peer- reviewed engagement.

PSO2:Graduates will analyze complex datasets using appropriate methodologies, develop and test innovative hypotheses, and effectively communicate sustainable, evidence- based solutions to global challenges through interdisciplinary collaboration.

Course Outcomes (COs)

CO1: analyze the physical, chemical, and biological properties of water and wastewater; compare various drinking-water sources and standards; and evaluate appropriate treatment technologies

CO2:design and conduct standard analytical procedures for water and wastewater while adhering to lab safety and quality protocols, accurately interpret results, and relate findings to water quality standards

Mapping matrix of POs , PSOs and COs

	POs			PSOs		
CO \ PO	1	2	CO Avg	1	2	CO Avg
CO1	3	3	3.0	3	3	3.0
CO2	3	2	2.5	3	2	2.5
PO /CO Avg	3.0	2.5		3.0	2.5	

(1-weak correlation; 2-medium correlation; 3-strong correlation)

This course will provide theoretical as well as practical knowledge about analysis of water.

Teaching Pedagogy

1. Lecture method
2. Seminar method
3. Demonstrations method

Teaching Methods and Tools

1.Direct Teaching using Black board,
2. Presentations,
3. Multimedia resources,
4. Diagrams and Layouts,
5. Group discussion and activity,
6. Experimentation,
7. Hands on training

Detailed Syllabus		
Unit-1 Theory (Credit: 01, Teaching Hours: 15)		
	Title	**Number of Teaching Hours**
1	**Drinking water** Physical, chemical, and biological properties of water, types of water sources,drinking waterstandards, quality of drinking water,	02
2	Handling and collection of samples,,	02
3	Water pollution	02
4	Purification of drinking water: Sedimentation, filtration and disinfection	02
5	**Wastewater** Types of wastewater, chemical and microbiological characteristics of waste water,	02
6	pollution problems due to disposal of untreated wastewater. ,	01
7	Primary treatment , secondary treatment	02
8	Advanced treatment and final treatment, Solid waste processing: Anaerobic sludge digestion and composting	02
	Unit-2 Practical (Credit: 01, Teaching Hours: 30)	
1	Introduction to analytical laboratory – Safety, Equipment's and techniques used in Laboratory.	07
2	To determine Alkalinity of Water	2
3	To determine the total hardness of the water sample	2
4	To determine pH and conductance of waste water	1
5	To determine dissolved oxygen of waste water	5
6	To determine Acidity of Water	2
7	To determine TS, TSS, TDS of water	2
8	To determine salinity of the given water sample	2
9	To study the viable count of microorganisms in water sample (N. agar)	2
10	Multiple tube fermentation method (presumptive, confirm and completed test), MPN	5

Assessment Method	
Internal/Online Assessment	1. One internal theory examination 2. Internal Practical Examination
External Assessment	1. Term End External Theory examination 2. External Practical Examination

References-

APHA (American Public Health Association, American water works Association andwater pollution control federation). (1980), Standard methods for the examination ofwater and waste water, Am. Publication Health Association, Washington, DC, USA.

NEERI, Manual on water and waste water Analysis, National Environment Engineering Research Institute Nagpur, (3402) (1986).

WHO, guideline for drinking water quality Genewa (1984)

Food Safety and Standards Authority of India, Manual of Methods of Analysis of Foods and Water.